Application No.: 10/773,671 Amendment dated May 11, 2006 Reply to Office Action of 1/12/06 REPLACEMENT SHEET

Fig.2

 $\langle 16 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$ 

| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                                   |
|-------|------------------|----------------------|-----------------------------------|
| 1     | TiO <sub>2</sub> | 0.2707               | } ≧(QUARTER-WAVE)                 |
| 2     | SiO <sub>2</sub> | 0.2577               | \( \leq \( \text{QUARTER-WAVE} \) |
| 3     | TiO <sub>2</sub> | 0.2115               | <b>l</b> )                        |
| 4     | SiO <sub>2</sub> | 0.2287               | <br> } ≦(QUARTER-WAVE)            |
| 5     | TiO <sub>2</sub> | 0.2323               | = (QOAKTEK WAVE)                  |
| 6     | SiO <sub>2</sub> | 0.2476               | J                                 |
| 7     | TiO <sub>2</sub> | 0.2729               | ]                                 |
| 8     | SiO <sub>2</sub> | 0.2885               |                                   |
| 9     | TiO <sub>2</sub> | 0.3011               |                                   |
| 10    | SiO <sub>2</sub> | 0.3196               | _ , _ , ,                         |
| 11    | TiO <sub>2</sub> | 0.3238               | $\} \ge (QUARTER-WAVE)$           |
| 12    | SiO <sub>2</sub> | 0.3304               | [·]                               |
| 13    | TiO <sub>2</sub> | 0.3372               |                                   |
| 14    | SiO <sub>2</sub> | 0.3265               |                                   |
| 15    | TiO <sub>2</sub> | 0.3064               | J                                 |
| 16    | SiO <sub>2</sub> | 0.1402               | ≦(QUARTER-WAVE)                   |

(FIRST EMBODIMENT)

Fig.3

# $\langle 18 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| •     | •                | • •                  |                                       |
|-------|------------------|----------------------|---------------------------------------|
| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                                       |
| 1.    | TiO <sub>2</sub> | 0.2643               | ) >(OLIABTED MAYE)                    |
| 2     | SiO <sub>2</sub> | 0.2574               | $\} \ge (QUARTER-WAVE)$               |
| 3     | TiO <sub>2</sub> | 0.2181               | ]                                     |
| 4     | SiO <sub>2</sub> | 0.2268               |                                       |
| 5     | TiO <sub>2</sub> | 0.2298               | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ |
| 6     | SiO <sub>2</sub> | 0.2401               | J                                     |
| 7     | TiO <sub>2</sub> | 0.2654               | ]                                     |
| 8     | SiO <sub>2</sub> | 0.2724               |                                       |
| 9     | TiO <sub>2</sub> | 0.2799               |                                       |
| 10    | SiO <sub>2</sub> | 0.2942               |                                       |
| 11    | TiO <sub>2</sub> | 0.3172               | _ , ,                                 |
| 12    | SiO <sub>2</sub> | 0.3240               | $\} \ge (QUARTER-WAVE)$               |
| 13    | TiO <sub>2</sub> | 0.3341               | <del> </del>  -                       |
| 14    | SiO <sub>2</sub> | 0.3340               |                                       |
| 15    | TiO <sub>2</sub> | 0.3331               |                                       |
| 16    | SiO <sub>2</sub> | 0.3193               |                                       |
| 17    | TiO <sub>2</sub> | 0.3004               | ]                                     |
| 18    | SiO <sub>2</sub> | 0.1455               | ≦(QUARTER-WAVE)                       |

(SECOND EMBODIMENT)

Fig.4

# $\langle 20 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                            |
|-------|------------------|----------------------|----------------------------|
| 1     | TiO <sub>2</sub> | 0.2726               | } ≧(QUARTER-WAVE)          |
| 2     | SiO <sub>2</sub> | 0.2567               | CQUARTER-WAVE)             |
| 3     | TiO <sub>2</sub> | 0.2203               | ]                          |
| 4     | SiO <sub>2</sub> | 0.2370               | · ·                        |
| 5     | TiO <sub>2</sub> | 0.2197               | $  \} \leq (QUARTER-WAVE)$ |
| 6     | SiO <sub>2</sub> | 0.2404               |                            |
| 7     | TiO <sub>2</sub> | 0.2462               | IJ                         |
| 8     | SiO <sub>2</sub> | 0.2786               | ]                          |
| 9     | TiO <sub>2</sub> | 0.2838               |                            |
| 10    | SiO <sub>2</sub> | 0.2773               |                            |
| 11    | TiO <sub>2</sub> | 0.2998               |                            |
| 12    | SiO <sub>2</sub> | 0.3232               |                            |
| 13    | TiO <sub>2</sub> | 0.3159               | <br> <br>  ≧(QUARTER-WAVE) |
| 14    | SiO <sub>2</sub> | 0.3300               | (QUARTER-WAVE)             |
| 15    | TiO <sub>2</sub> | 0.3352               |                            |
| 16    | SiO <sub>2</sub> | 0.3349               |                            |
| 17    | TiO <sub>2</sub> | 0.3397               |                            |
| 18    | SiO <sub>2</sub> | 0.3162               |                            |
| 19    | TiO <sub>2</sub> | 0.3105               | J                          |
| 20    | SiO <sub>2</sub> | 0.1527               | ≦(QUARTER-WAVE)            |

(THIRD EMBODIMENT)

Fig.5

# $\langle 22 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| LAYER | MATERIAL         | OPTICAL<br>THICKNESS | ·                                   |
|-------|------------------|----------------------|-------------------------------------|
| 1     | TiO <sub>2</sub> | 0.2695               | $\} \ge (QUARTER-WAVE)$             |
| 2     | SiO <sub>2</sub> | 0.2561               | ] \( \leq \( \text{QUARTER-WAVE} \) |
| 3     | TiO <sub>2</sub> | 0.2167               | ]] .                                |
| 4     | SiO <sub>2</sub> | 0.2351               | }<br>} ≦(QUARTER-WAVE)              |
| 5     | TiO <sub>2</sub> | 0.2204               | ] ( = (QUARTER WAVE)                |
| 6     | SiO <sub>2</sub> | 0.2435               | ] J                                 |
| 7     | TiO <sub>2</sub> | 0.2525               | ])                                  |
| 8     | SiO <sub>2</sub> | 0.2749               | ]                                   |
| 9     | TiO <sub>2</sub> | 0.2767               |                                     |
| 10    | SiO <sub>2</sub> | 0.2727               | ] [                                 |
| 11    | TiO <sub>2</sub> | 0.2985               | ] [                                 |
| 12    | SiO <sub>2</sub> | 0.3100               |                                     |
| 13    | TiO <sub>2</sub> | 0.3108               |                                     |
| 14    | SiO <sub>2</sub> | 0.3245               | $] \rangle \geq (QUARTER-WAVE)$     |
| 15    | TiO <sub>2</sub> | 0.3221               |                                     |
| 16    | SiO <sub>2</sub> | 0.3241               | ]                                   |
| 17    | TiO <sub>2</sub> | 0.3424               | ]                                   |
| 18    | SiO <sub>2</sub> | 0.3321               |                                     |
| 19    | TiO <sub>2</sub> | 0.3393               | ]                                   |
| 20    | SiO <sub>2</sub> | 0.3227               | ]                                   |
| 21    | TiO <sub>2</sub> | 0.3095               | <b>]</b> J                          |
| 22    | SiO <sub>2</sub> | 0.1551               | $] \leq (QUARTER-WAVE)$             |

(FOURTH EMBODIMENT)

Fig.6

# $\langle 24 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                                |
|-------|------------------|----------------------|--------------------------------|
| 1     | TiO <sub>2</sub> | 0.2711               | 1                              |
| 2     | SiO <sub>2</sub> | 0.2559               | $\} \ge (QUARTER-WAVE)$        |
| 3     | TiO <sub>2</sub> | 0.2103               | l) · · ·                       |
| 4     | SiO <sub>2</sub> | 0.2362               | ]                              |
| 5     | TiO <sub>2</sub> | 0.2230               | (QUARTER-WAVE)                 |
| 6     | SiO <sub>2</sub> | 0.2417               | IJ                             |
| 7     | TiO <sub>2</sub> | 0.2560               | <b>1</b> )                     |
| 8     | SiO <sub>2</sub> | 0.2686               |                                |
| 9     | TiO <sub>2</sub> | 0.2732               |                                |
| 10    | SiO <sub>2</sub> | 0.2685               | · ·                            |
| 11    | TiO <sub>2</sub> | 0.2894               |                                |
| 12    | SiO <sub>2</sub> | 0.3020               | · ·                            |
| 13    | TiO <sub>2</sub> | 0.3027               |                                |
| 14    | SiO <sub>2</sub> | 0.3210               |                                |
| 15    | TiO <sub>2</sub> | 0.3258               | $  \rangle \ge (QUARTER-WAVE)$ |
| 16    | SiO <sub>2</sub> | 0.3229               |                                |
| 17.   | TiO <sub>2</sub> | 0.3337               |                                |
| 18    | SiO <sub>2</sub> | 0.3264               |                                |
| 19    | TiO <sub>2</sub> | 0.3449               |                                |
| 20    | SiO <sub>2</sub> | 0.3411               |                                |
| 21    | TiO <sub>2</sub> | 0.3417               | -                              |
| 22    | SiO <sub>2</sub> | 0.3203               |                                |
| 23    | TiO <sub>2</sub> | 0.3067               | J                              |
| 24    | SiO <sub>2</sub> | 0.1517               | $\leq$ (QUARTER-WAVE)          |

(FIFTH EMBODIMENT)

Fig.7

# $\langle 26 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| $ \begin{array}{ c c c c c } \hline LAYER & MATERIAL & OPTICAL \\ THICKNESS \\ \hline 1 & TiO_2 & 0.2680 \\ 2 & SiO_2 & 0.2560 \\ \hline 3 & TiO_2 & 0.2139 \\ 4 & SiO_2 & 0.2257 \\ \hline 5 & TiO_2 & 0.2308 \\ 6 & SiO_2 & 0.2377 \\ \hline 7 & TiO_2 & 0.2593 \\ 8 & SiO_2 & 0.2591 \\ 9 & TiO_2 & 0.2655 \\ \hline 10 & SiO_2 & 0.2604 \\ \hline 11 & TiO_2 & 0.2812 \\ \hline 13 & TiO_2 & 0.2832 \\ \hline 14 & SiO_2 & 0.2812 \\ \hline 13 & TiO_2 & 0.3152 \\ \hline 16 & SiO_2 & 0.3221 \\ \hline 17 & TiO_2 & 0.3297 \\ \hline 18 & SiO_2 & 0.3297 \\ \hline 18 & SiO_2 & 0.3277 \\ \hline 20 & SiO_2 & 0.3320 \\ \hline 21 & TiO_2 & 0.3320 \\ \hline 21 & TiO_2 & 0.3322 \\ \hline 24 & SiO_2 & 0.3119 \\ \hline 25 & TiO_2 & 0.3010 \\ \hline 26 & SiO_2 & 0.1480 \\ \hline \end{array} \right\} \geq (QUARTER-WAVE) $ |       | •                | • •    | •                                 |
|--|-------|------------------|--------|-----------------------------------|
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | LAYER | MATERIAL         |        |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 1     | TiO <sub>2</sub> | 0.2680 | ) >(OLIADTED WAVE)                |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 2     | SiO <sub>2</sub> | 0.2560 | \ \leq (QUARTER-WAVE)             |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 3     | TiO <sub>2</sub> | 0.2139 | )                                 |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 4     | SiO <sub>2</sub> | 0.2257 | SOMADTED WAVE                     |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 5     |                  | 0.2308 | \ \(\leq \(\text{QUARTER-WAVE}\)  |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$  |       | SiO <sub>2</sub> | 0.2377 | J                                 |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 7     | TiO <sub>2</sub> | 0.2593 | <u> </u>                          |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 8     | SiO <sub>2</sub> | 0.2591 |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 9     | TiO <sub>2</sub> | 0.2655 |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 10    | SiO <sub>2</sub> | 0.2604 |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 11    | TiO <sub>2</sub> | 0.2724 | [ <del>]</del> .                  |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 12    | SiO <sub>2</sub> | 0.2812 |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 13    | TiO <sub>2</sub> | 0.2832 |                                   |
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$   | 14    | SiO <sub>2</sub> | 0.2958 |                                   |
| 16     SiO2     0.3221       17     TiO2     0.3297       18     SiO2     0.3277       19     TiO2     0.3277       20     SiO2     0.3320       21     TiO2     0.3433       22     SiO2     0.3362       23     TiO2     0.3322       24     SiO2     0.3119       25     TiO2     0.3010  | 15    | TiO <sub>2</sub> | 0.3152 | >(OLIADTED_WAVE)                  |
| 18     SiO2     0.3277       19     TiO2     0.3277       20     SiO2     0.3320       21     TiO2     0.3433       22     SiO2     0.3362       23     TiO2     0.3322       24     SiO2     0.3119       25     TiO2     0.3010  |       | SiO <sub>2</sub> | 0.3221 | \( \leq \( \text{QUARTER WAVE} \) |
| 19     TiO2     0.3277       20     SiO2     0.3320       21     TiO2     0.3433       22     SiO2     0.3362       23     TiO2     0.3322       24     SiO2     0.3119       25     TiO2     0.3010   | 17    | TiO <sub>2</sub> | 0.3297 |                                   |
| 20     SiO <sub>2</sub> 0.3320       21     TiO <sub>2</sub> 0.3433       22     SiO <sub>2</sub> 0.3362       23     TiO <sub>2</sub> 0.3322       24     SiO <sub>2</sub> 0.3119       25     TiO <sub>2</sub> 0.3010  | 18    | SiO <sub>2</sub> | 0.3277 |                                   |
| 21 TiO2 0.3433   22 SiO2 0.3362   23 TiO2 0.3322   24 SiO2 0.3119   25 TiO2 0.3010   |       |                  | 0.3277 |                                   |
| 22 SiO2 0.3362   23 TiO2 0.3322   24 SiO2 0.3119   25 TiO2 0.3010  |       | SiO <sub>2</sub> | 0.3320 |                                   |
| 23 TiO <sub>2</sub> 0.3322<br>24 SiO <sub>2</sub> 0.3119<br>25 TiO <sub>2</sub> 0.3010   |       |                  | 0.3433 |                                   |
| 24 SiO <sub>2</sub> 0.3119<br>25 TiO <sub>2</sub> 0.3010   |       | SiO <sub>2</sub> | 0.3362 | <b>   </b>                        |
| 25 TiO <sub>2</sub> 0.3010   |       | TiO <sub>2</sub> |        |                                   |
|  |       |                  |        |                                   |
|  |       |                  |        | J                                 |
|  | 26    | SiO <sub>2</sub> | 0.1480 | ≦(QUARTER-WAVE)                   |

(SIXTH EMBODIMENT)

Fig.9

# $\langle 18 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                                   |
|-------|------------------|----------------------|-----------------------------------|
| 1     | TiO <sub>2</sub> | 0.256                | } ≧(QUARTER-WAVE)                 |
| 2     | MgF <sub>2</sub> | 0.260                | S = (QUARTER-WAVE)                |
| 3     | TiO <sub>2</sub> | 0.228                | ]                                 |
| 4     | MgF <sub>2</sub> | 0.227                | <br> <br> } ≦(QUARTER-WAVE)       |
| 5_    | TiO <sub>2</sub> | 0.238                | \( \leq \( \text{QUARTER-WAVE} \) |
| 6     | MgF <sub>2</sub> | 0.233                | ]                                 |
| 7     | TiO <sub>2</sub> | 0.263                | )                                 |
| 8     | MgF <sub>2</sub> | 0.269                | [ <u>]</u>                        |
| 9     | TiO <sub>2</sub> | 0.279                |                                   |
| 10    | MgF <sub>2</sub> | 0.281                |                                   |
| 11    | TiO <sub>2</sub> | 0.314                |                                   |
| 12    | MgF <sub>2</sub> | 0.321                | } ≧(QUARTER-WAVE)                 |
| 13    | TiO <sub>2</sub> | 0.337                |                                   |
| 14    | MgF <sub>2</sub> | 0.324                |                                   |
| 15    | TiO <sub>2</sub> | 0.318                |                                   |
| 16    | MgF <sub>2</sub> | 0.317                |                                   |
| 17    | TiO <sub>2</sub> | 0.314                | J                                 |
| 18    | MgF <sub>2</sub> | 0.157                | ≦(QUARTER-WAVE)                   |

(SEVENTH EMBODIMENT)

Fig.10

# $\langle 20 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| \20   |                  | /t = / 30mm//        | •                        |
|-------|------------------|----------------------|--------------------------|
| LAYER | MATERIAL         | OPTICAL<br>THICKNESS |                          |
| 1     | TiO <sub>2</sub> | 0.277                | ) >(OLIABTED WAVE)       |
| 2     | MgF <sub>2</sub> | 0.257                | $\} \ge (QUARTER-WAVE)$  |
| 3     | TiO <sub>2</sub> | 0.218                | )                        |
| 4     | MgF <sub>2</sub> | 0.239                | S(OHADTED MAYE)          |
| 5     | TiO <sub>2</sub> | 0.228                | $\} \leq (QUARTER-WAVE)$ |
| 6     | MgF <sub>2</sub> | 0.238                | <u> </u>                 |
| 7     | TiO <sub>2</sub> | 0.265                | )                        |
| 8     | MgF <sub>2</sub> | 0.277                |                          |
| 9     | TiO <sub>2</sub> | 0.273                |                          |
| 10    | MgF <sub>2</sub> | 0.275                |                          |
| 1.1   | TiO <sub>2</sub> | 0.293                |                          |
| 12    | MgF <sub>2</sub> | 0.302                |                          |
| 13    | TiO <sub>2</sub> | 0.302                | } ≧(QUARTER-WAVE)        |
| 14    | MgF <sub>2</sub> | 0.322                |                          |
| _ 15  | TiO <sub>2</sub> | 0.330                |                          |
| 16    | MgF <sub>2</sub> | 0.331                |                          |
| 17    | TiO <sub>2</sub> | 0.327                |                          |
| 18    | MgF <sub>2</sub> | 0.317                |                          |
| 19    | TiO <sub>2</sub> | 0.317                | J                        |
| 20    | MgF <sub>2</sub> | 0.156                | ≦(QUARTER-WAVE)          |

(EIGHTH EMBODIMENT)

Fig.13

# $\langle 21 \text{ LAYERS}(\lambda = 750 \text{nm}) \rangle$

| ·     |                                |                      |   |
|-------|--------------------------------|----------------------|---|
| LAYER | MATERIAL                       | OPTICAL<br>THICKNESS |   |
|       | Al <sub>2</sub> O <sub>3</sub> | 0.1323               | ·   |
| 1     | TiO <sub>2</sub>               | 0.2570               | ) >(OLIABTED WAYE)                                |
| 2     | SiO <sub>2</sub>               | 0.2501               | $\} \ge (QUARTER-WAVE)$                           |
| 3     | TiO <sub>2</sub>               | 0.2235               | j .   |
| 4     | SiO <sub>2</sub>               | 0.2258               | S(OLIADTED MANE)                                  |
| 5     | TiO <sub>2</sub>               | 0.2344               | $\left.\right\} \leq \left( QUARTER-WAVE \right)$ |
| 6     | SiO <sub>2</sub>               | 0.2370               | J   |
| 7     | TiO <sub>2</sub>               | 0.2588               | ) -   |
| 8     | SiO <sub>2</sub>               | 0.2639               |   |
| 9     | TiO <sub>2</sub>               | 0.2788               |   |
| 10    | SiO <sub>2</sub>               | 0.2819               | •   |
| 11    | TiO <sub>2</sub>               | 0.3026               |   |
| 12    | SiO <sub>2</sub>               | 0.3109               | } ≧(QUARTER-WAVE)                                 |
| 13    | TiO <sub>2</sub>               | 0.3209               | = (QUARTER-WAVE)                                  |
| 14    | SiO <sub>2</sub>               | 0.3240               |   |
| 15    | TiO <sub>2</sub>               | 0.3320               |   |
| 16    | SiO <sub>2</sub>               | 0.3304               |   |
| 17    | TiO <sub>2</sub>               | 0.3399               |   |
| 18    | SiO <sub>2</sub>               | 0.3214               |   |
| 19    | TiO <sub>2</sub>               | 0.3115               | J   |
| 20    | SiO <sub>2</sub>               | 0.1515               | ≦(QUARTER-WAVE)                                   |

(NINTH EMBODIMENT)